

The Nymphs, and a New Species, of North American *Setvena* *Illies* (Plecoptera: Perlodidae)¹

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Stewart and Stark (1984) provided an updated account of nymphs of the 22 North American Perlodinae genera, including the first complete generic key to nymphs and comparative illustrations of the type or other representative species of each genus. That paper provided a complete treatment of nymphs of the 10 monospecific genera, and a useful baseline for the eventual study and analysis of the relatively poorly known nymphs of the remaining 12 genera, representing 43 species.

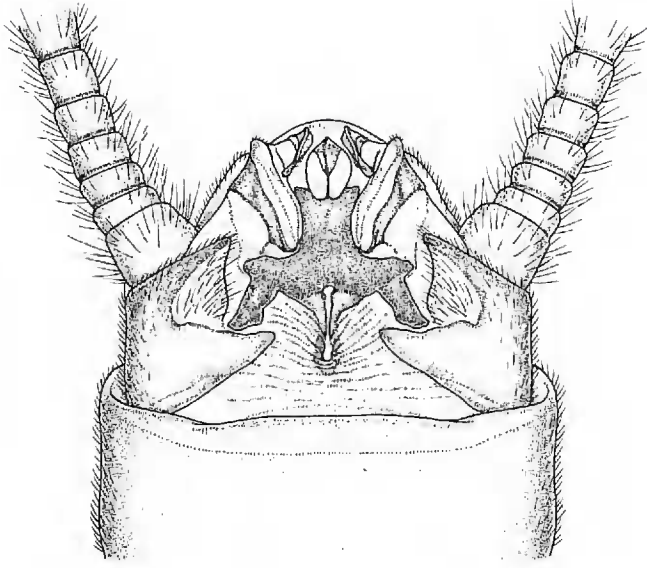
The only comparative studies of nymphs at the species level have been for *Diploperla* (Kondratieff et al., 1981), *Helopicus* (Stark and Ray, 1983), and *Hydroperla* (Ray and Stark, 1981). This study was undertaken to continue efforts to provide comparative descriptions, keys and illustrations for the nymphs of all species in this large and ecologically important subfamily of stoneflies, and specifically for nymphs of the genus *Setvena* Illies.

The genus *Setvena*, previously a subgenus of *Arcynopteryx* (Ricker, 1952) is a distinctive group having simple, finger-like anteroventral gills (nymphs) or gill remnants (adults) on the meso- and metathorax (Ricker, 1952; Shepard and Stewart, 1983; Stewart and Stark, 1984). Two species, *Setvena bradleyi* (Smith) and *Setvena tibialis* (Banks) have been recognized (Smith, 1917; Frison, 1942; Ricker, 1952; Illies, 1966; Stewart and Stark, 1984). The nymphs of *S. tibialis* have never been formally described, illustrated or compared with those of *S. bradleyi*. *S. bradleyi* nymphs were described by Claassen (1931) with illustrations of the labrum, mandibles, maxillae and labium, and by Stewart and Stark (1984) with diagnostic illustrations of the head-pronotum pattern, mandible, maxilla, front leg, mesosternum, thoracic ventrum with gills, male and female abdominal sternae and cerci.

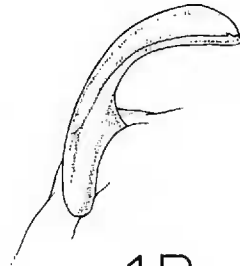
MATERIALS AND METHODS

We began collecting and rearing nymphs of *Setvena* in 1979, as part of a larger study of nymphs of North American Plecoptera genera by K. W. Stewart and B. P. Stark. The large nymphs of this genus live in cool, high mountain streams in the Coast and Cascade Mountains (*S. tibialis*) and northern Rocky Mountains (*S. bradleyi*) (Ricker, 1964) and are difficult to rear outside their native streams. Individuals of both species were reared in styrofoam containers in the field or in living streams at simulated stream temperatures (Stewart and Stark, 1984) or

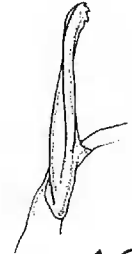
¹ Study supported by National Science Foundation Grants #DEB 78-12565, BSR8308422 and the Faculty Research Fund of North Texas State University.



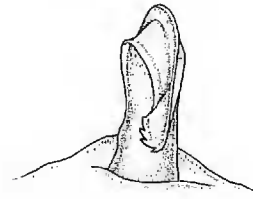
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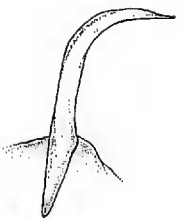
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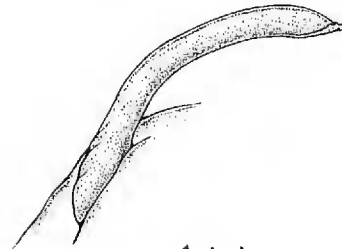
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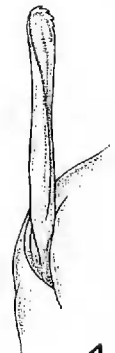
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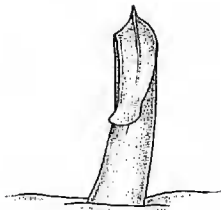
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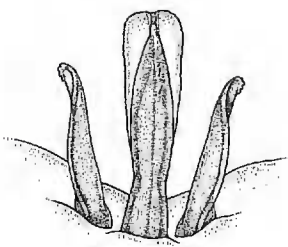
1I



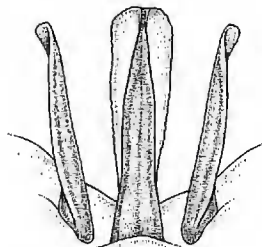
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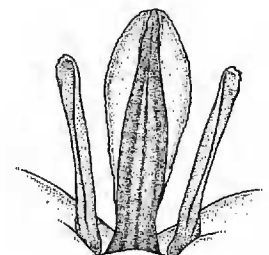
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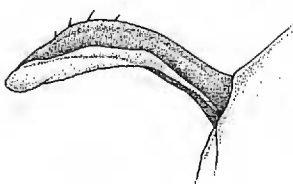
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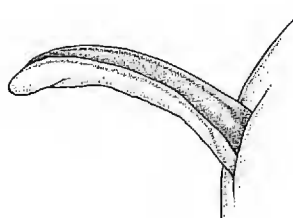
1M



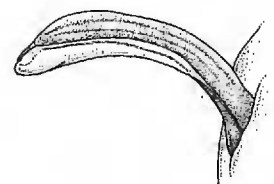
1O



1L



1N



1P

correlated with adults by removing the nymphal cuticle of mature nymphs, after gently heating in 10% KOH to reveal the underlying adult genitalia. Drawings of nymphal characters and adult genitalia were made with aid of a Wild M-5A Stereomicroscope Drawing Attachment, and in some cases Scanning Electron Microscopy.

***Setvena wahkeena*, NEW SPECIES**

Description.—Male: Body length 23–25 mm. Brachypterous, wings 10–11 mm, extending to about 7th abdominal segment. General color brown with yellow markings. Head brown, darker bordering M-line anterior to median ocellus; yellow spot middle of frons; oval yellow spot in ocellar triangle, bordered by dark brown; yellow band from lateral ocelli to interior margin compound eyes; broad yellow band down middle of occipital area, extending transversely to near lateral margins of head; reticulate pattern medial to compound eyes faintly visible; antennae brown. Prothorax narrower than head and wider anteriorly; anterior angles acute, posterior angles rounded; color brown with broad, yellow medial stripe, wider posteriorly and with rounded, yellow rugosities either side. Legs yellow-brown; femora brown distally; tibiae brown proximally and distally; tarsi yellow-brown. Abdomen yellow-brown dorsally with dark band across anterior margin of segments; tergum 10 with complete medial cleft, and produced anteriomedially as narrow processes (Fig. 1A); epiproct narrow, apex membranous on either side of midline, darkly sclerotized at base and along dorsal and ventral surface (Fig. 1A); lateral stylets stout, and curved from lateral view (Fig. 1B), narrow in dorsal view, with high rounded crest and apex produced laterally at tip as 3–4 small teeth (Fig. 1C, D, K).

Female: Unknown.

Nymph: Body color dark brown with brown clothing hairs. Head with small yellow triangles lateral to each lateral ocellus and small yellow oval spots anterior to each lateral ocellus; pair narrow transverse light bars anterior to light M-line on frons; occipital spinule row mostly 1–2 spinules wide, curving forward and meeting at stem of ecdysial line (Fig. 2A). Anterior surface forelegs with short, blunt spinules and few scattered medium length spinules (Fig. 2B). Posterior spinule fringe of first 5 abdominal tergae very short, blunt, slightly longer on last 5 segments (Fig. 2C), mostly equal in length on Ab₉ (Fig. 2D); intercalary spinules very short (Fig. 2C, D).

Types.—Holotype ♂ from small stream ca. 0.5 mi west of mile 18 on Bridal Veil Scenic Rd, 1.5 mi west of Wahkeena Falls, Multnomah Co., Oregon, 1-IV-1983, K. W. Stewart; deposited in USNM. Paratype ♂ from Oregon, Multnomah Co., Wahkeena Falls, 30-VI-1957, S. G. Jewett, Jr. (NTSU).

Etymology.—This species is named after the Wahkeena Falls area where it is found.

←

Figure 1. Adult male characters of *Setvena*. *S. wahkeena*: A, terminalia (dorsal); B, C, D, lateral, dorsal and oblique anterior views of right lateral stylet; K, L, dorsal and lateral views of epiproct. *S. bradleyi*: E, F, G, lateral, dorsal and oblique lateral views of right lateral stylet; M, N, dorsal and lateral views of epiproct. *S. tibialis*: H, I, J, lateral, dorsal and oblique lateral views of right lateral stylet; O, P, dorsal and lateral views of epiproct.

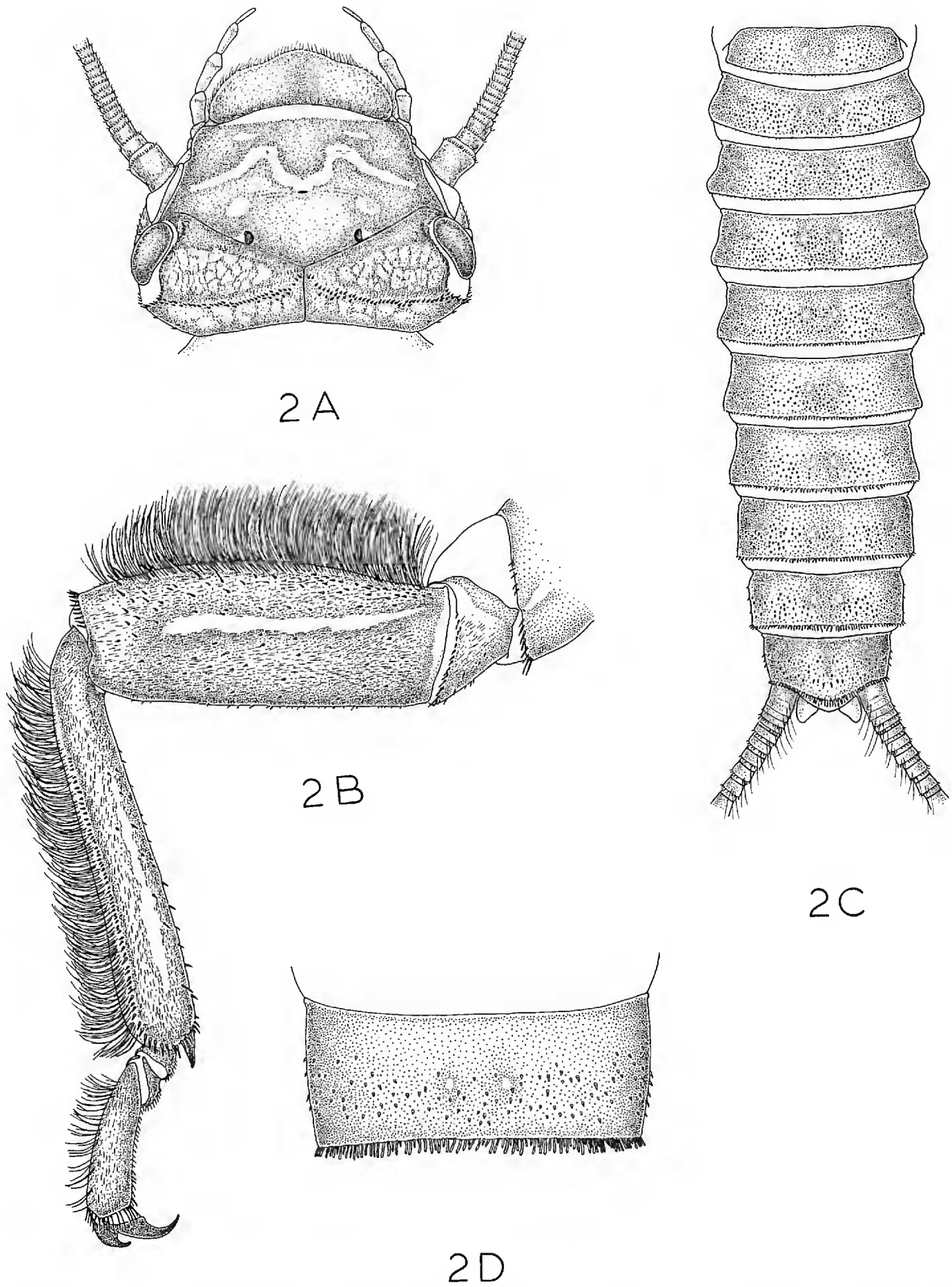


Figure 2. Nymphal characters of *Setvena wahkeena*: A, dorsum head; B, right front leg (anterior); C, dorsum abdomen; D, dorsum Ab₉.

Diagnosis.—Lateral stylets of male *S. wahkeena* are strongly, evenly curved and stout in lateral view (Fig. 1B). Dorsally they have a high, narrow crest (Fig. 1C, D), and their rounded tips bear 3–4 small sharp teeth (Fig. 1C, D, K). The lateral stylets of *S. bradleyi* males are narrow, falcate in lateral view (Fig. 1E) and have a low dorsal crest (Fig. 1F, G, M). Lateral stylets of *S. tibialis* are less strongly curved than the other 2 species (Fig. 1H) with a very low dorsal crest and 4 small

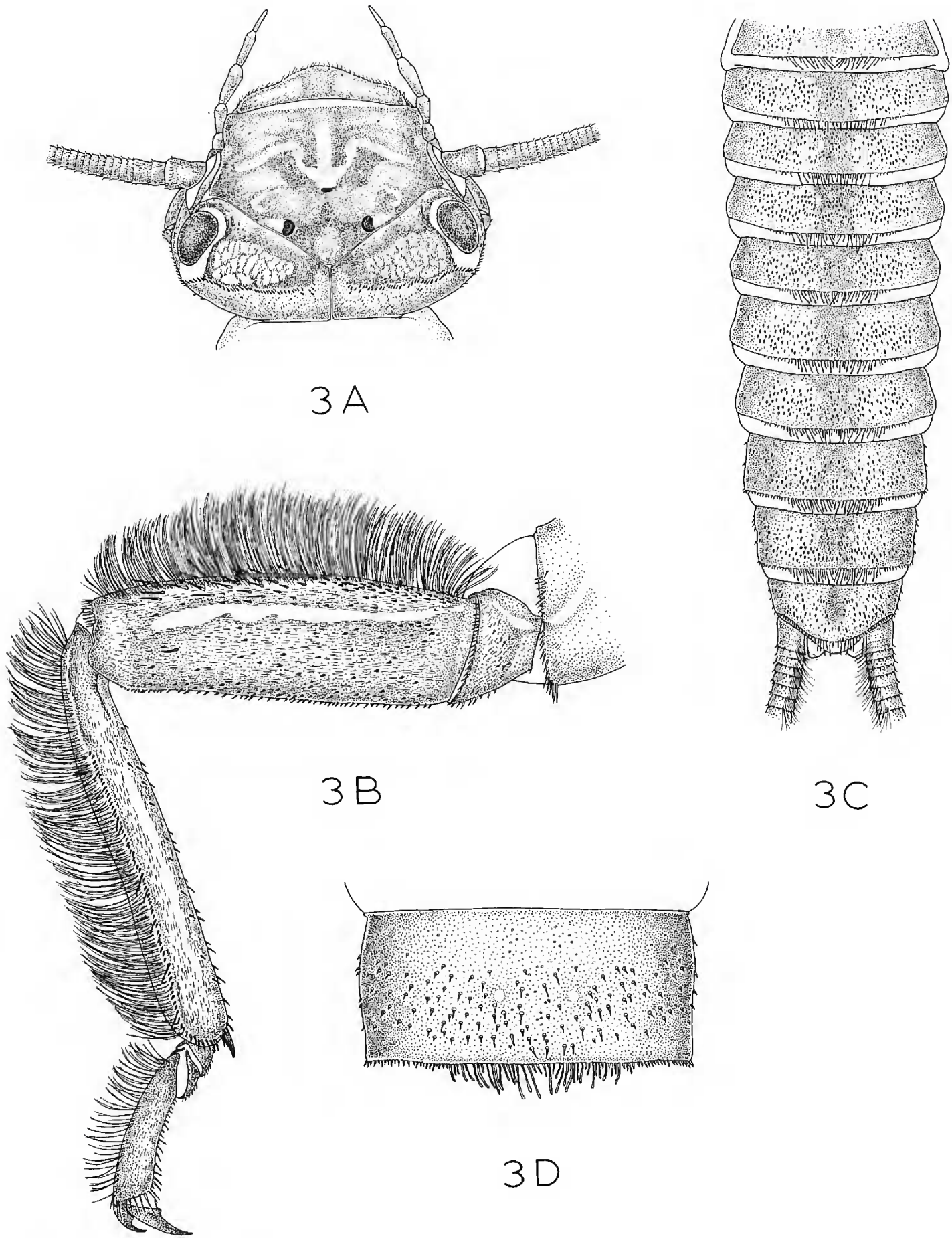


Figure 3. Nymphal characters of *Setvena bradleyi*: A, dorsum head; B, right front leg (anterior); C, dorsum abdomen; D, dorsum Ab₆.

teeth on a rounded tip (Fig. 1I, J, O). The dorsal sclerotized portion of the *S. wahkeena* epiproct: (1) is more robust (Fig. 1K, L) than that of *S. bradleyi*, (2) its sides are more evenly curved and convex in dorsal view (Fig. 1K) than *S. tibialis* (Fig. 1O), and (3) its dorsal carina bears 2–4 short, stout hairs (Fig. 1K, L), unlike *S. bradleyi* or *S. tibialis*.

Nymphs of *S. wahkeena* can be distinguished from the other 2 species by the

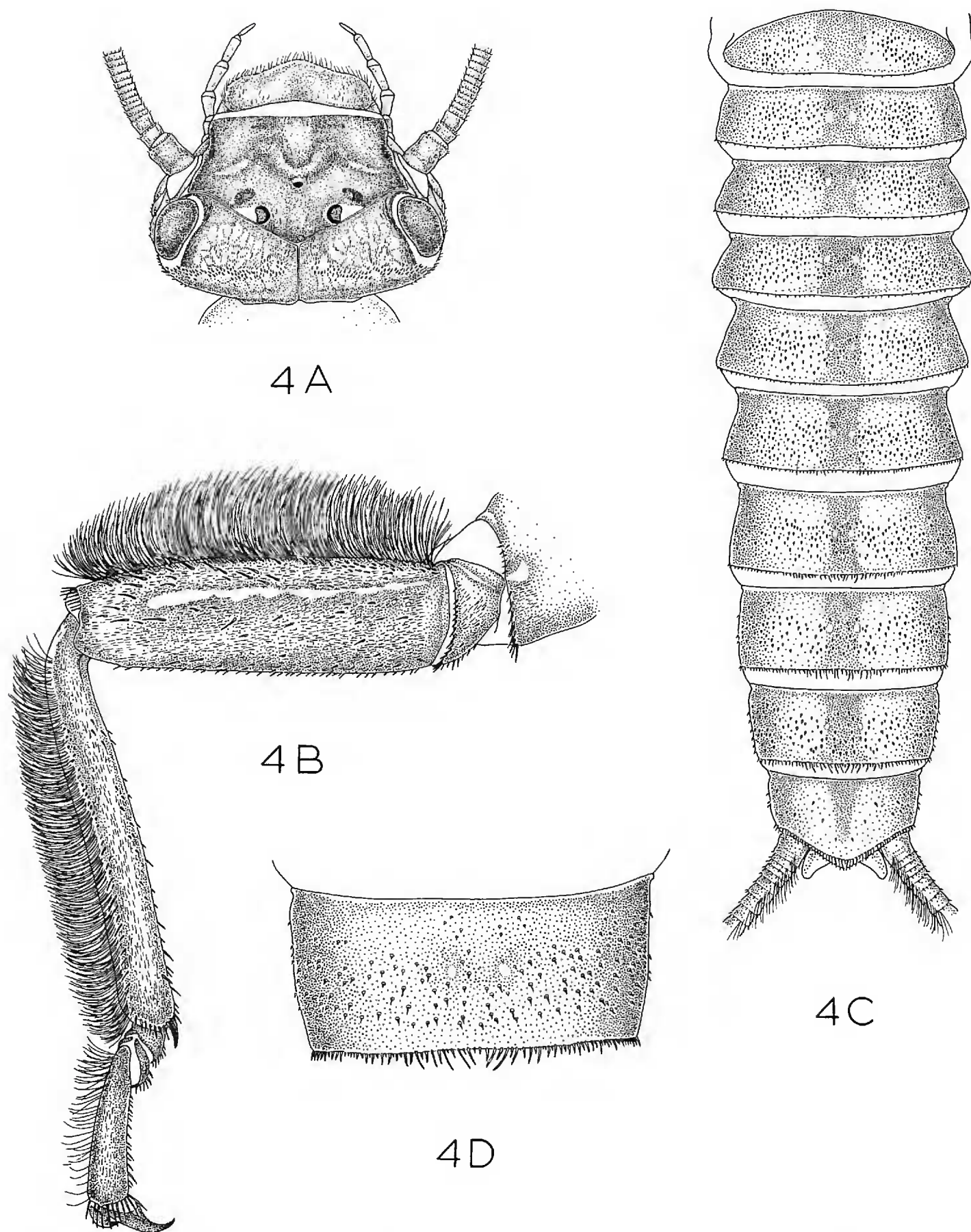


Figure 4. Nymphal characters of *Setvena tibialis*: A, dorsum head; B, right front leg (anterior); C, dorsum abdomen; D, dorsum Ab₉.

4 small yellow spots on the frons, narrow occipital spinule row curved forward and meeting on stem of ecdysial suture (Fig. 2A), short spinules on anterior margin of front legs (Fig. 2B), and short posterior row of blunt spinules on abdominal tergite (Fig. 2C, D).

S. bradleyi nymphs have a distinctive head pattern with falcate yellow spots anterolateral to lateral ocelli and a medial light bar forward of the light M marking

(Fig. 3A); the occipital spinule row is mostly single, not curved forward and meeting medially as in *S. wahkeena* (Fig. 3A). There are a few longer spinules adjacent to the femoral and tibial hair fringes of the front legs in addition to short spinules (Fig. 3A), and the posterior spinules of all abdominal tergae are long in a wide medial band (Fig. 3C, D), unlike those of *S. tibialis* and *S. wahkeena*.

Nymphs of *S. tibialis* do not have the distinct medial light bar anterior to M-line as in *S. bradleyi*, nor the light spots anterolateral to lateral ocelli present in both *S. bradleyi* and *S. wahkeena*. The occipital spinule row of *S. tibialis* is distinctive, being a band 2–4 wide, not meeting medially at the ecdysial stem (Fig. 4A). *S. tibialis* front legs have several long sharp hairs (Fig. 4B) and the posterior fringe of spinules (Fig. 4C, D) on abdominal tergae are intermediate between *S. wahkeena* (Fig. 2C, D) and *S. bradleyi* (Fig. 3C, D), and are sharp-tipped rather than blunt as in the other 2 species.

Material examined.—*Setvena bradleyi*—BRITISH COLUMBIA: Head of Gwillim Cr., Gladshelm Mossif, NW Slocum City, 22-VII-1958, John Ricker, ♂, ♀; 8.8 mi N Vermilion Lodge, 28-VI-1967, J. and R. Wold, 3 N. IDAHO: Lemhi Co., Wagonhammer Spring, 2 mi S North Fork, 28-V-1969, 6 N, 11-VI-1969, 2 ♂, B. R. Oblad, 23-VII-1979, K. Stewart, B. Stark, R. Baumann, 10 N. MONTANA: Glacier N.P., Avalanche Cr., 20-VII-1958, W. E. Ricker, 2 EX, Iceberg Cr., 27-VII-1965, A. R. Gaufin, ♂; Gallatin Co., Hyalite Cr., 10, 11-VII-1979, J. Fraley, 12 N; Ravalli Co., Str. below Lost Trail Pass, 8-VIII-1979, J. Fraley, 3 N; Lake Co., Crane Cr., 2 mi S Bigfork, 20-VI-1981, 19 N, Boulder Cr., E Shore Flathead Lk., 21-VI-1981, 7 N, Teepee Cr., 12 mi S Big Fork, Hwy 35, 21-VI-1981, 8 N, 26-VI-1981, ♀ (reared), N, K. Stewart, B. Shepard. OREGON (New State Record): Wallowa Mts., Trail to Horseshoe Lake, 10-VII-1968, E. Evans, 2 N.

Setvena tibialis—OREGON: Grant Co., Onion Cr., Strawberry Mt. 7700 ft elev., 18-VII-1936, R. E. Rieder, 2 N; Mt. Hood, Trib of Salmon R., 5-IV-1964, S. G. Jewett, Jr., 2 N; Hood River Co., Mt. Hood, S of Parkdale, 11-VII-1968, E. Evans, 22 N, Mt. Hood Meadows, 13-VII-1979, K. Stewart, B. Stark, 2 N, ♂ (reared), Newton Cr., Hwy 35, 13-VII-1979, K. Stewart, B. Stark, 2 N; Clackamas Co., Mt. Hood, 3 mi blw. Timberline Lodge and Still Cr. C. G., 12-VII-1979, K. Stewart, B. Stark, 16 N. WASHINGTON: Pierce Co., Mt. Ranier N.P., Fish Cr., N, St. Andrews Cr., 19 N, Sm. str at Reflection Lk., 13-VII-1979, K. Stewart, B. Stark, N.

Setvena wahkeena—OREGON: Multomah Co., Wahkeena Falls, 30-VI-1957, S. G. Jewett, Jr., Paratype ♂; sm. str off S side Bridal Veil Scenic Rd., 0.5 mi W mile 18 and 1.5 mi W Wahkeena Falls, 1-IV-1983, K. W. Stewart, holotype ♂ (reared), 12 N (one a well-developed ♂ with cuticle separated and underlying genitalia fully developed).

KEY TO ADULT *SETVENA* MALES

1. Apex of lateral stylets not distinctly serrated (Fig. 1G, M), stylets slender and falcate in lateral view (Fig. 1E); sclerotized dorsal portion of epiproct slender (Fig. 1M) *bradleyi*
 Apex of lateral stylets with distinct teeth (Fig. 1C, D, I, J, K, O); sclerotized dorsal portion of epiproct robust (Fig. 1K, O) 2
2. Lateral stylets stout, strongly curved in side view (Fig. 1B), with a prom-

- inent raised dorsal crest (Fig. 1C, D); epiproct with 2–4 short, stout hairs on median, dorsal carina (Fig. 1K, L) *wahkeena*
 Lateral stylets less strongly curved in side view (Fig. 1H), with low carina-like dorsal crest (Fig. 1H–J); epiproct without short, stout dorsal hairs (Fig. 1O, P) *tibialis*

KEY TO *SETVENA* NYMPHS

1. Head with distinct light medial bar anterior to M-pattern (Fig. 3A), occipital spinule row mostly single not meeting medially (Fig. 3A), long posterior fringe of blunt spinules on all Ab. tergae (Fig. 3C, D) ... *bradleyi*
 Head without anterior medial bar, occipital spinule row 2–4 wide and/or meeting medially at ecdysial stem; posterior spinule fringe very short on first 5 abdominal segments 2
2. Occipital spinule row 2–4 wide, not meeting medially (Fig. 4A), posterior spinules longer medially on segments 7–10 and with sharp tips (Fig. 4C, D) *tibialis*
 Occipital spinule row 1–2 wide, curved forward medially and meeting at ecdysial stem (Fig. 2A), posterior Ab. spinules mostly even length on Ab. segments, and with blunt tips (Fig. 2C, D) *wahkeena*

ACKNOWLEDGMENTS

We are indebted to Drs. R. W. Baumann, J. D. Lattin, B. P. Stark, S. W. Syczytko and W. E. Ricker who loaned us nymphs and adults for study, and to John Fraley and Dr. W. D. Shepard for help in field collecting.

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